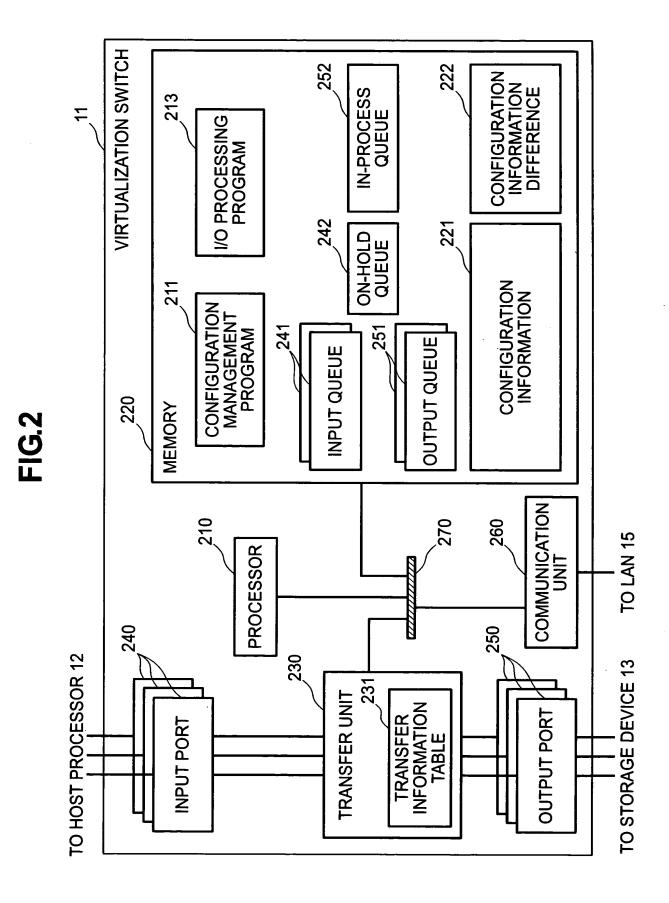
Applicant: Kazuyoshi SERIZAWA, et al.

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Title: STORAGE SYSTEM
Atty D cket No. 16869N-102200US

She t 2 f 29



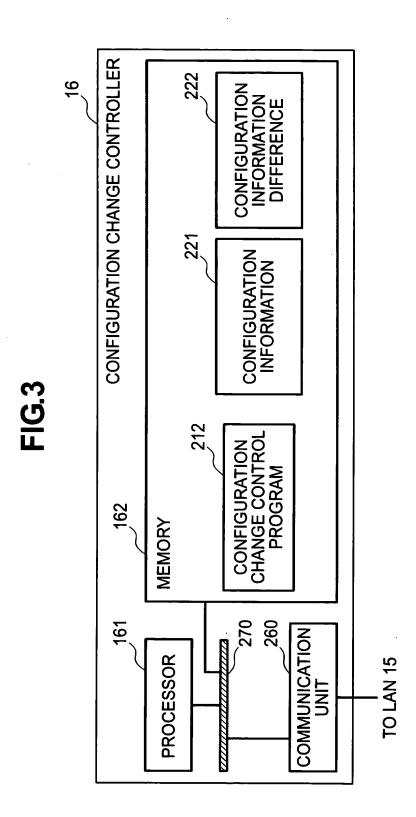
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Atty D cket N . 16869N-102200US

Sheet 3 f 29



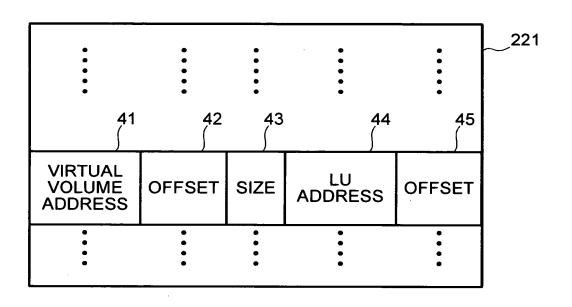
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Sh t 4 f 29

FIG.4

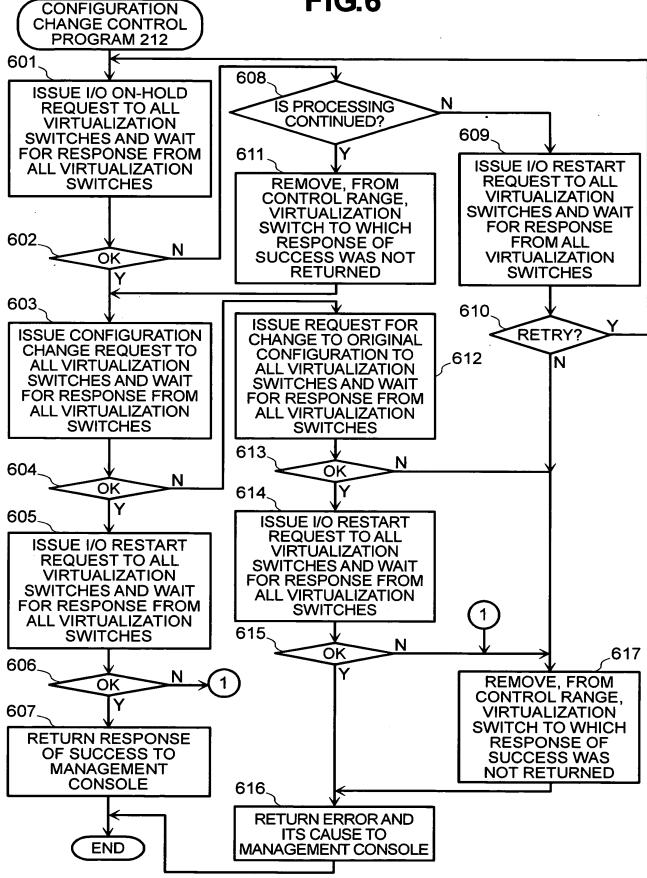


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Title: STORAGE SYSTEM

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Robert C. Colwell, Reg. No. 27,431 (650) 326-2400 Applicant: Kazuyoshi SERIZAWA, et al. Titl: STORAGE SYSTEM Atty Docket No. 16869N-102200US Sh t 6 f 29 FIG.6 608. N **IS PROCESSING CONTINUED?** 609. 611. ISSUE I/O RESTART REQUEST TO ALL REMOVE, FROM CONTROL RANGE, VIRTUALIZATION VIRTUALIZATION SWITCHES AND WAIT FOR RESPONSE SWITCH TO WHICH **RESPONSE OF FROM ALL** SUCCESS WAS NOT VIRTUALIZATION RETURNED **SWITCHES** 610. ISSUE REQUEST FOR **RETRY?** CHANGE TO ORIGINAL **CONFIGURATION TO** 612 N ALL VIRTUALIZATION SWITCHES AND WAIT FOR RESPONSE FROM ALL VIRTUALIZATION **SWITCHES** 613. Ν OK 614 **ISSUE I/O RESTART** REQUEST TO ALL VIRTUALIZATION SWITCHES AND WAIT FOR RESPONSE FROM ALL VIRTUALIZATION **SWITCHES** 615.



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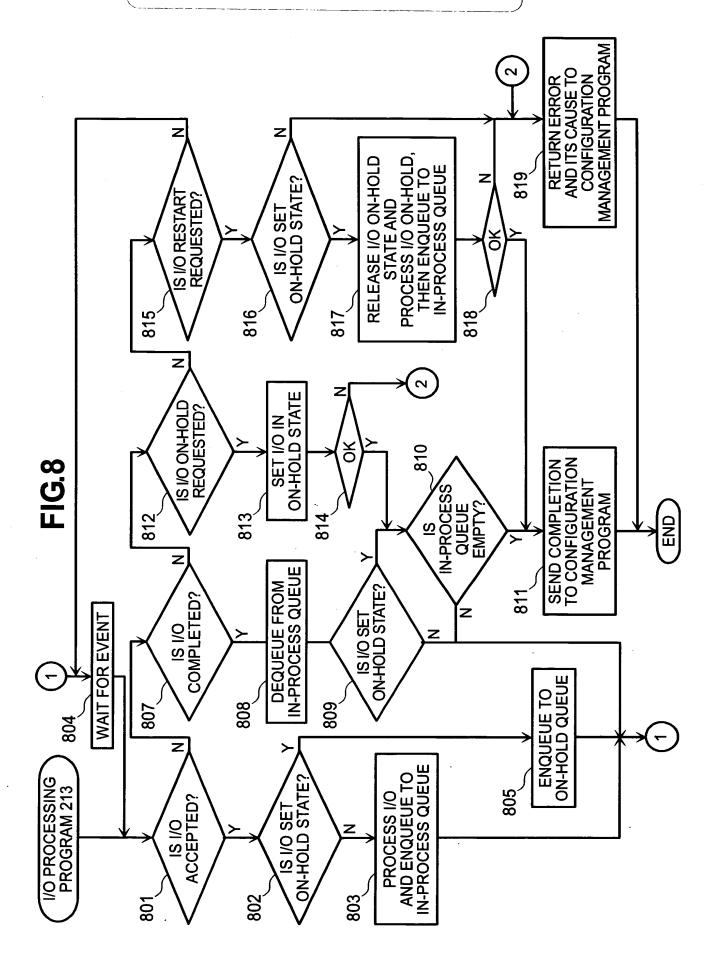
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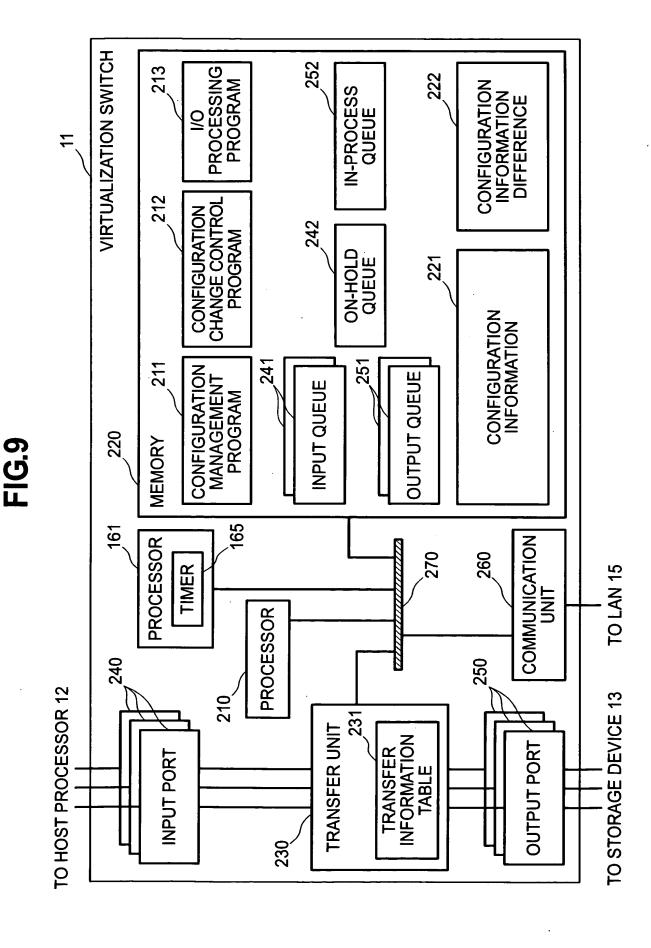
Atty D ck t N . 16869N-102200US

Sh et 8 of 29



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Title: STORAGE SYSTEM
Atty Docket No. 16869N-102200US

Sh et 9 f 29



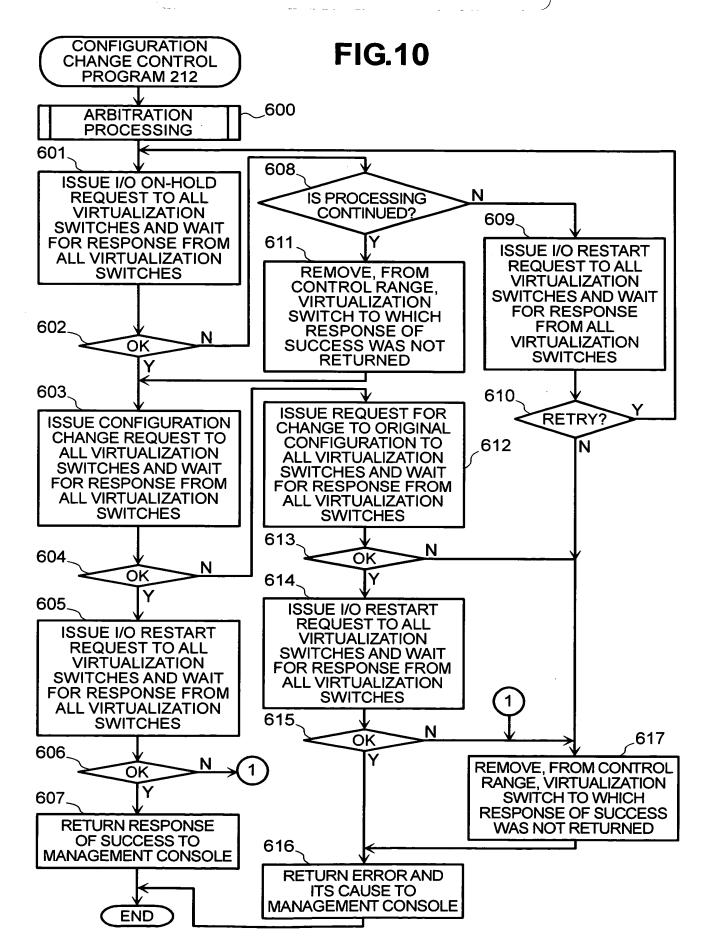
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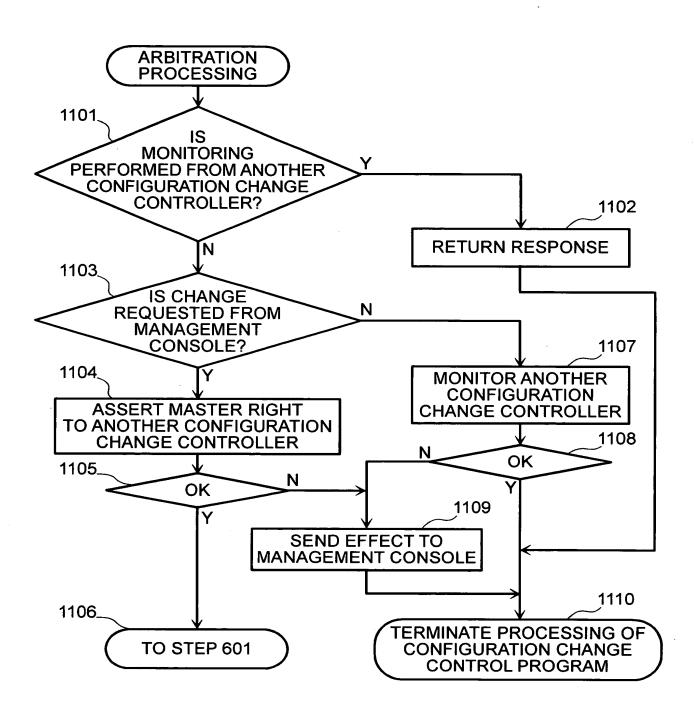
Sh t 10 f 29



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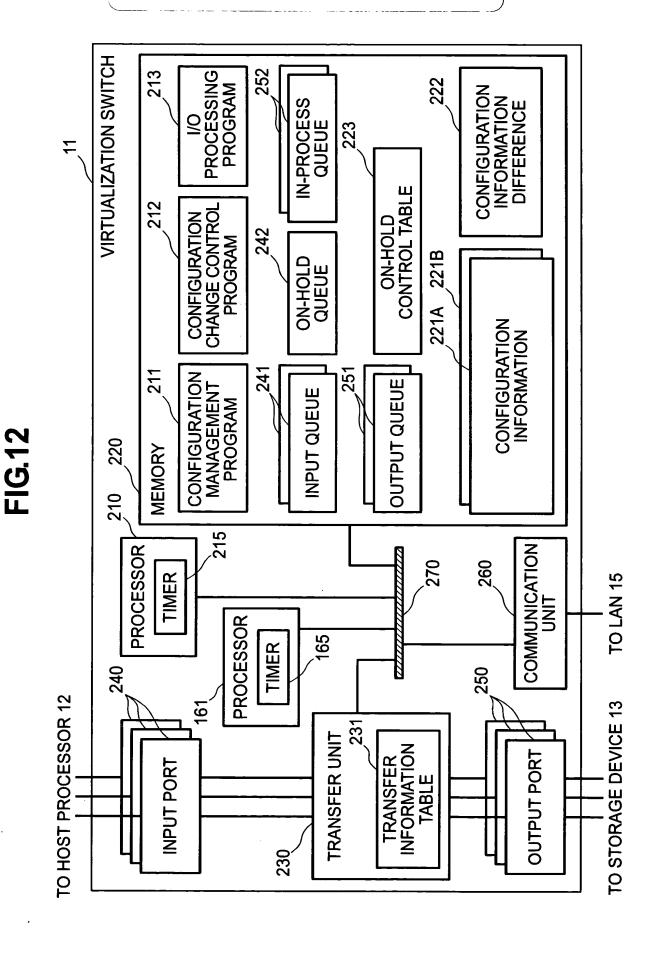
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Title: STORAGE SYSTEM
Atty Docket No. 16869N-102200US
Sheet 11 f 29

FIG.11



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Title: STORAGE SYSTEM
Atty Docket No. 16869N-102200US

Sheet 12 f 29



Robert C. Colwell, Reg. No. 27,431 (650) 326-2400 Applicant: Kazuyoshi SERIZAWA, et al. : STORAGE SYSTEM Atty Docket No. 16869N-102200US Sh et 13 f 29 **CREATE CONFIGURATION** STORE CONFIGURATION WAIT FOR COMPLETION OF ALL IN-PROCESS I/O RESTART ON-HOLD I/O INFORMATION (REAR) **DIFFERENCE AND** SWITCH FACE OF CONFIGURATION INFORMATION VIRTUALIZATION SWITCH 11 507 503 531 511 530 502 506' 510 DIFFERENCE TO ALL VIRTUALIZATION SWITCHES COMPLETE RECEIVING OF CONFIGURATION INFORMATION DIFFERENCE SEND CONFIGURATION INFORMATION SEND CONFIGURATION INFORMATION SEND I/O ON-HOLD COMPLETION SEND I/O RESTART COMPLETION REQUEST I/O RESTART TO ALL VIRTUALIZATION SWITCHES REQUEST I/O ON-HOLD TO ALL VIRTUALIZATION SWITCHES COMPLETE CONFIGURATION INFORMATION SWITCHING SWITCHING INSTRUCTION FIG. 13 CONFIGURATION CHANGE CONTROL FUNCTION 508, 532 504 512 FROM ALL VIRTUALIZATION SWITCHES FROM ALL VIRTUALIZATION SWITCHES FROM ALL VIRTUALIZATION SWITCHES FROM ALL VIRTUALIZATION SWITCHES WAIT FOR COMPLETION REPORT WAIT FOR COMPLETION REPORT WAIT FOR COMPLETION REPORT WAIT FOR COMPLETION REPORT 514 INSTRUCT CONFIGURATION SEND CONFIGURATION CHANGE COMPLETION TO MANAGEMENT CONSOLE MANAGEMENT CONSOLE CHANGE FROM

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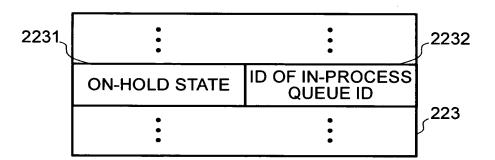
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Titl: STORAGE SYSTEM

Atty D cket No. 16869N-102200US Sheet 14 of 29

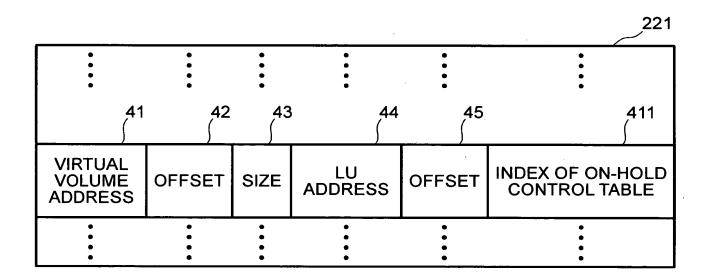
FIG.14



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Title: STORAGE SYSTEM
Atty D cket No. 16869N-102200US
Sheet 15 f 29

FIG.15



Robert C. Colwell, Reg. No. 27,431 (650) 326-2400 Applicant: Kazuyoshi SERIZAWA, et al. Titl: STORAGE SYSTEM Atty Docket No. 16869N-102200US Sh et 16 of 29 CONFIGURATION CHANGE **FIG.16** CONTROL PROGRAM 212 600 ARBITRATION PROCESSING SEND CONFIGURATION 625 INFORMATION DIFFERENCE TO ALL VIRTUALIZATION SWITCHES AND WAIT FOR RESPONSE FROM **ALL VIRTUALIZATION SWITCHES** ISSUE I/O ON-HOLD REQUEST TO ALL VIRTUALIZATION 608 SWITCHES AND WAIT FOR IS PROCESSING RESPONSE FROM ALL **CONTINUED?** 609 VIRTUALIZATION SWITCHES ISSUE I/O RESTART 611 REQUEST TO ALL REMOVE, FROM CONTROL VIRTUALIZATION RANGE, VIRTUALIZATION **SWITCHES** SWITCH TO WHICH AND WAIT FOR **IS RETRY** RESPONSE OF SUCCESS **RESPONSE FROM** REQUESTED? WAS NOT RETURNED ALL VIRTUALIZATION **SWITCHES** 612' 610 ISSUE REQUEST FOR ISSUE CONFIGURATION SWITCHING TO ORIGINAL **RETRY?** SWITCHING REQUEST TO **CONFIGURATION TO ALL** ALL VIRTUALIZATION VIRTUALIZATION N SWITCHES AND WAIT FOR SWITCHES AND WAIT FOR RESPONSE FROM ALL RESPONSE FROM ALL VIRTUALIZATION SWITCHES VIRTUALIZATION SWITCHES 613 Ν ŌΚ 614 ISSUE I/O RESTART REQUEST TO ALL VIRTUALIZATION SWITCHES AND WAIT FOR **ISSUE I/O RESTART REQUEST** RESPONSE FROM ALL TO ALL VIRTUALIZATION VIRTUALIZATION SWITCHES SWITCHES AND WAIT FOR RESPONSE FROM ALL VIRTUALIZATION SWITCHES 617 OK REMOVE, FROM CONTROL RANGE. VIRTUALIZATION SWITCH TO WHICH **RESPONSE OF** SUCCESS WAS **RETURN RESPONSE** NOT RETURNED OF SUCCESS TO 616 MANAGEMENT CONSOLE RETURN ERROR AND ITS CAUSE TO

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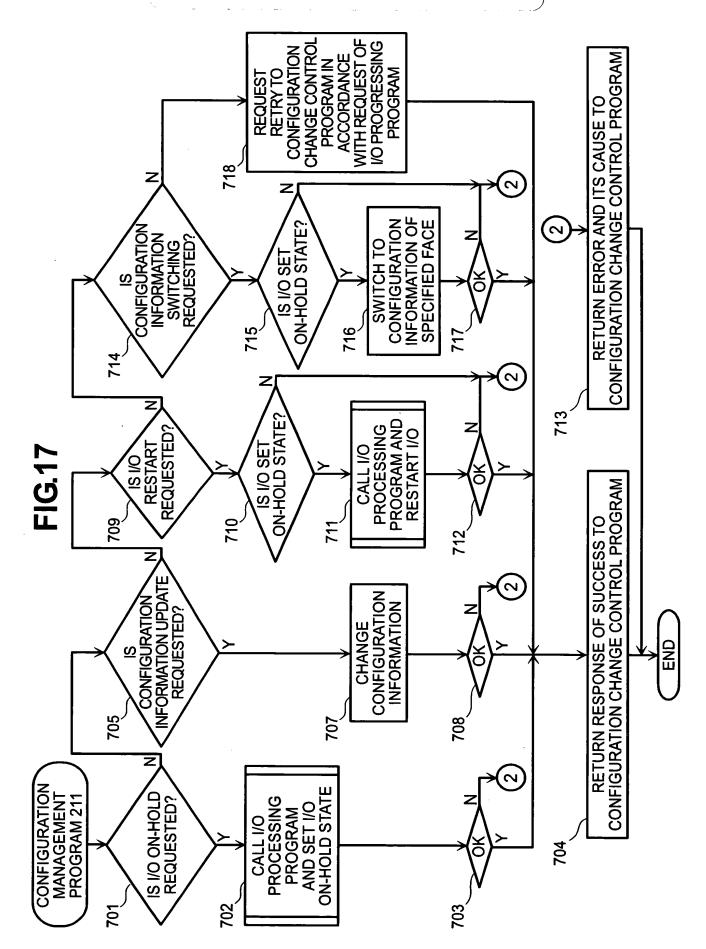
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Atty D cket No. 16869N-102200US

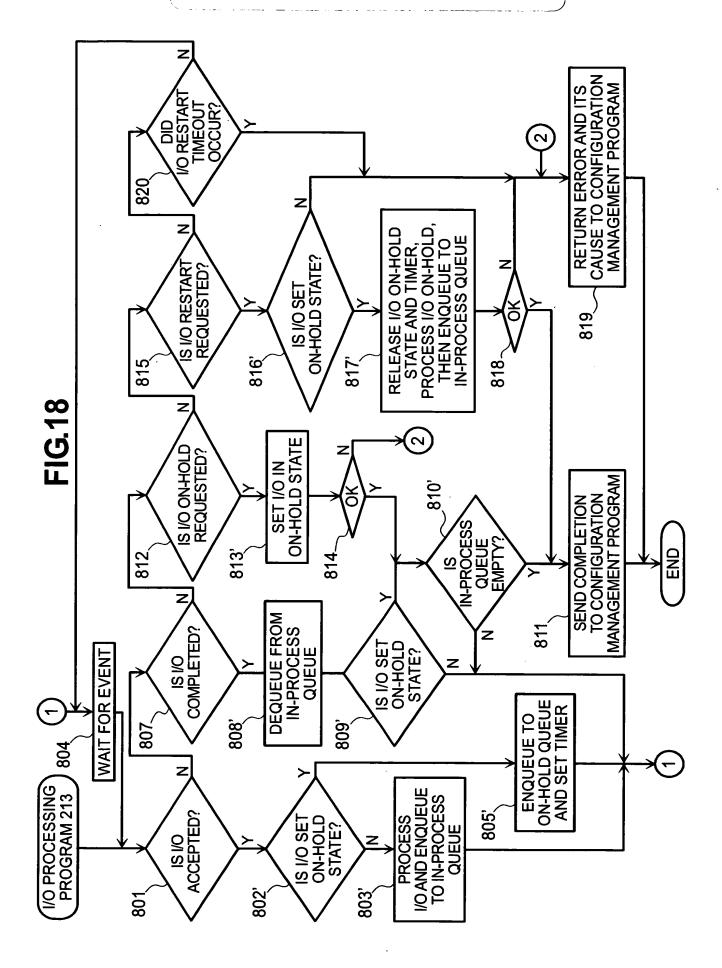
Sheet 17 f 29



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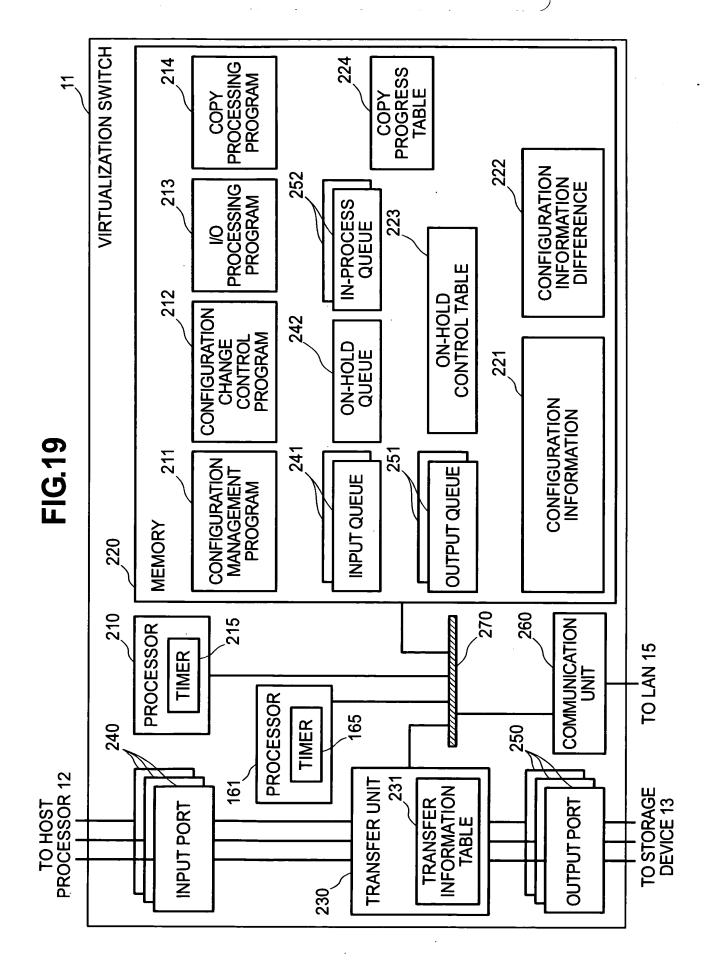
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Title: STORAGE SYSTEM
Atty Docket No. 16869N-102200US

She t 18 f 29



Applicant: Kazuyoshi SERIZAWA, et al.
Title: STORAGE SYSTEM
Atty Docket No. 16869N-102200US

Sheet 19 of 29



Applicant: Kazuyoshi SERIZAWA, et al.
Titl: STORAGE SYSTEM

Atty D cket No. 16869N-102200US

Sheet 20 f 29

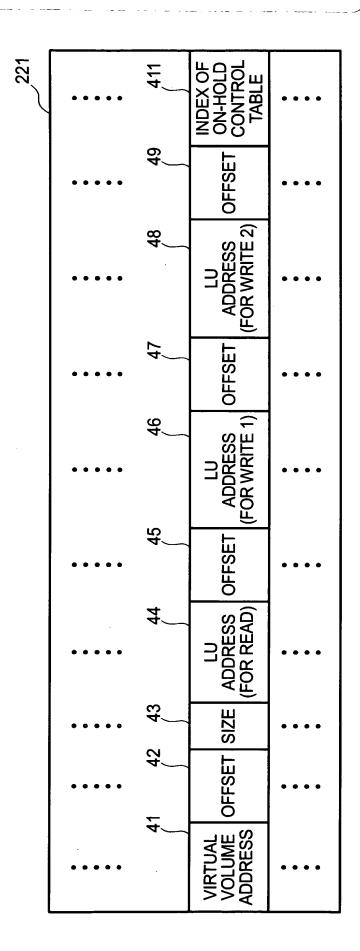


FIG.20

Robert C. Colwell, Reg. No. 27,431 (650) 326-2400 Applicant: Kazuyoshi SERIZAWA, et al. Title: STORAGE SYSTEM Atty Dock t No. 16869N-102200US Sh t 21 f 29 **CONFIGURATION CHANGE FIG.21 CONTROL PROGRAM 212** 600 ARBITRATION PROCESSING ISSUE I/O ON-HOLD REQUEST TO ALL VIRTUALIZATION 608 SWITCHES AND WAIT FOR Ν **IS PROCESSING** RESPONSE FROM ALL CONTINUED? VIRTUALIZATION SWITCHES 611 609 REMOVE, FROM CONTROL **ISSUE I/O RESTART** RANGE, VIRTUALIZATION SWITCH TO WHICH REQUEST TO ALL VIRTUALIZATION IS RETRY RESPONSE OF SUCCESS SWITCHES REQUESTED? WAS NOT RETURNED AND WAIT FOR RESPONSE FROM **ALL VIRTUALIZATION** 635 **SWITCHES COPY PROCESSING** RECOVERY PROCESSING 610 Ν **RETRY?** 612 N GENERATE CONFIGURATION ISSUE REQUEST FOR INFORMATION DIFFERENCE CHANGE TO ORIGINAL CONFIGURATION TO ALL VIRTUALIZATION **ISSUE CONFIGURATION** SWITCHES AND WAIT FOR CHANGE REQUEST TO ALL RESPONSE FROM ALL VIRTUALIZATION SWITCHES VIRTUALIZATION SWITCHES AND WAIT FOR RESPONSE FROM **ALL VIRTUALIZATION SWITCHES** 613 ŌK 2 614 ISSUE I/O RESTART REQUEST TO ALL VIRTUALIZATION ISSUE I/O RESTART REQUEST TO SWITCHES AND WAIT FOR RESPONSE FROM ALL **ALL VIRTUALIZATION SWITCHES** 1 AND WAIT FOR RESPONSE FROM VIRTUALIZATION SWITCHES **ALL VIRTUALIZATION SWITCHES** 615 617 OK REMOVE, FROM CONTROL RANGE, VIRTUALIZATION SWITCH TO WHICH IS COPYING RESPONSE OF COMPLETED? SUCCESS WAS NOT RETURNED 616 **RETURN RESPONSE** RETURN ERROR AND OF SUCCESS TO ITS CAUSE TO MANAGEMENT CONSOLE MANAGEMENT CONSOLE

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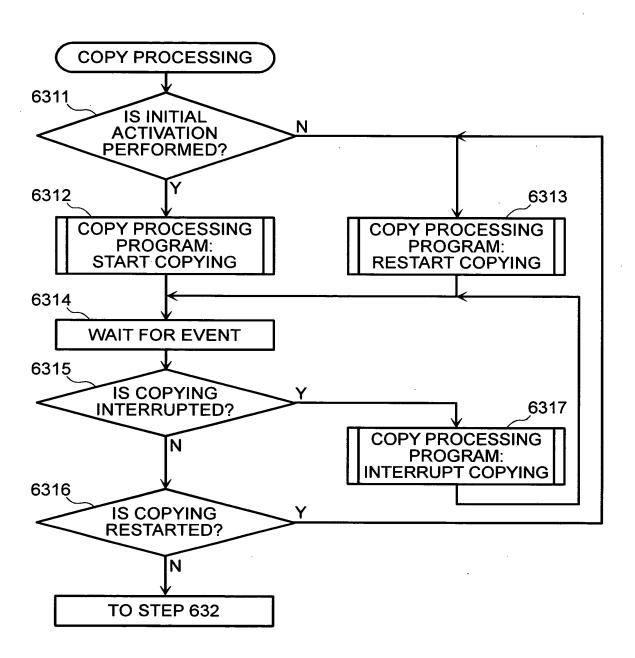
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Atty Docket No. 16869N-102200US

Sh et 22 f 29

FIG.22

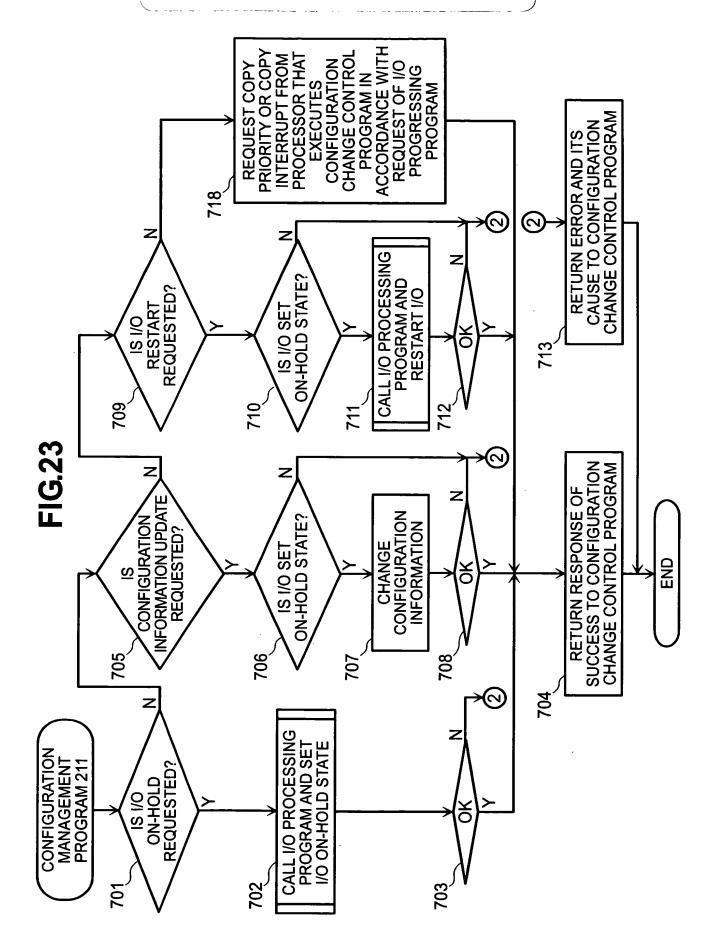


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Atty Docket No. 16869N-102200US

Sheet 23 of 29



Applicant: Kazuyoshi SERIZAWA, et al. Title: STORAGE SYSTEM Atty Dock t N . 16869N-102200US Sh et 24 f 29 Z CONFIGURATION INTERRUPT TO **MANAGEMENT** REQUEST COPY /O RESTAR **PROGRAM** TIMEOUT CAUSE TO CONFIGURATION OCCUR? MANAGEMENT PROGRAM RETURN ERROR AND ITS 820 821 Z Z RELEASE I/O ON-HOLD STATE AND PROCESS IN-PROCESS QUEUE THEN ENQUEUE SET ON-HOLD Z IS I/O RESTART REQUESTED? ON-HOLD I/O, **STATE?** S 819 818-816, 817 815 **FIG.24** Z (2) **REQUESTED?** ON-HOLD STATE ON-HOLD SET I/O IN MANAGEMENT PROGRAM 0/I SI SEND COMPLETION TO CONFIGURATION N-PROCESS QUEUE EMPTY? 814_ END 813, 812 Z SET ON-HOLD
STATE? DEQUEUE FROM S I/O IS I/O COMPLETED? IN-PROCESS QUEUE 810, 811 WAIT FOR EVENT PRIORITY FOR WRITE ON-HOLD QUEUE AND SET TIMER CONFIGURATION PROGRAM AND REQUEST COPY **ENQUEUE TO** 809, 808 807 804 SAL _ I/O PROCESSING PROGRAM 213 PROCESS QUEUE PROCESS I/O AND IS I/O
SET ON-HOLD
STATE? **ENQUEUE TO IN** ACCEPTED? 018 805, 806 802 803, 801

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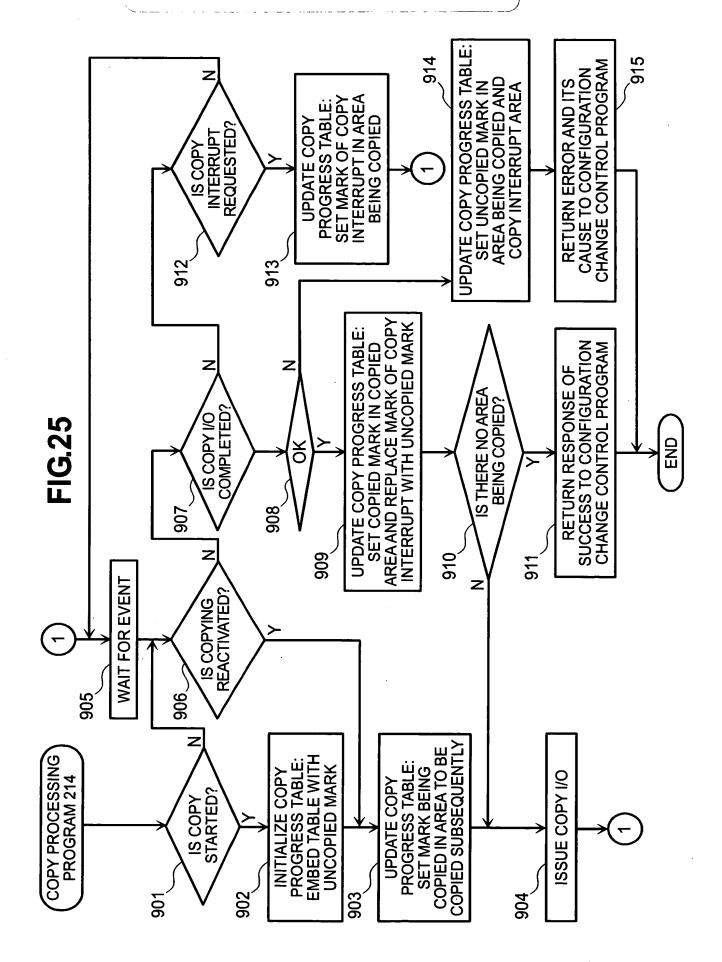
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Atty D ck t No. 16869N-102200US

She t 25 of 29



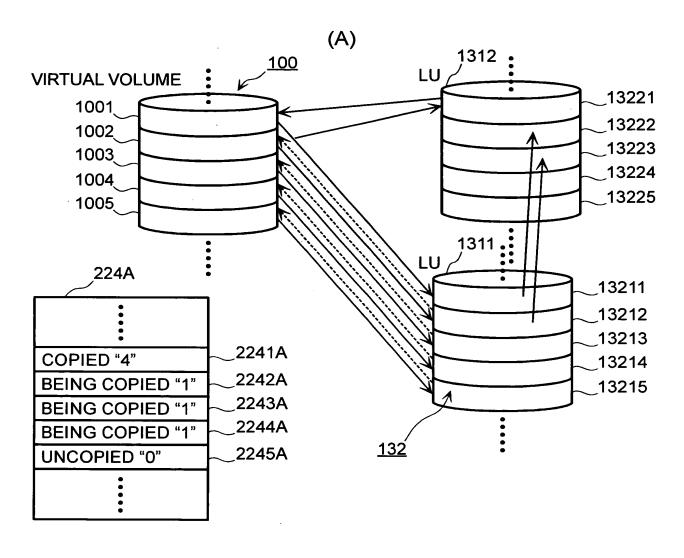
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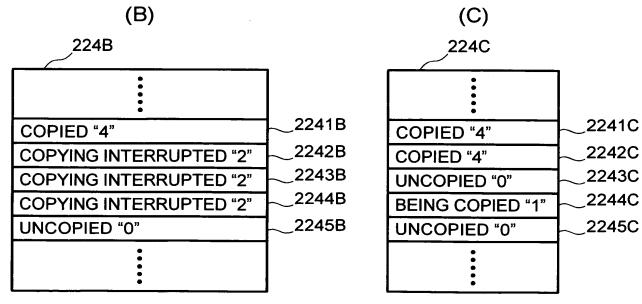
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Atty D ck t No. 16869N-102200US Sh t 26 f 29

FIG.26

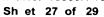


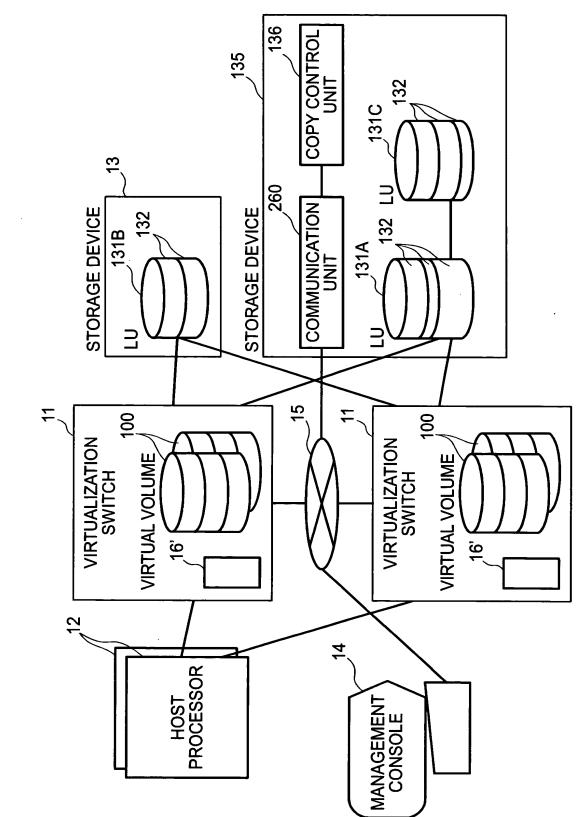


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Atty D ck t No. 16869N-102200US







Title: STORAGE SYSTEM Atty Docket No. 16869N-102200US Sheet 28 of 29 CONFIGURATION CHANGE **FIG.28** CONTROL PROGRAM 212 600 ARBITRATION PROCESSING SEND CONFIGURATION 625 INFORMATION DIFFERENCE TO ALL VIRTUALIZATION SWITCHES AND WAIT FOR RESPONSE FROM ALL VIRTUALIZATION SWITCHES 626 Ν OK 601 ISSUE I/O ON-HOLD REQUEST TO ALL VIRTUALIZATION 608 SWITCHES AND WAIT FOR IS PROCESSING **RESPONSE FROM ALL** CONTINUED? 609 VIRTUALIZATION SWITCHES 602 ISSUE I/O RESTART 611 N OK REQUEST TO ALL VIRTUALIZATION REMOVE, FROM CONTROL RANGE, VIRTUALIZATION SWITCHES 627 SWITCH TO WHICH **IS RETRY** AND WAIT FOR RESPONSE OF SUCCESS RESPONSE FROM REQUESTED? WAS NOT RETURNED ALL VIRTUALIZATION **SWITCHES** 612' 640 610 ISSUE REQUEST FOR REQUEST COMPLETION OF SWITCHING TO ORIGINAL **RETRY? COPY PROCESSING TO CONFIGURATION TO ALL** STORAGE DEVICE AND WAIT VIRTUALIZATION SWITCHES AND WAIT FOR FOR COMPLETION REPORT RESPONSE FROM ALL 603 VIRTUALIZATION SWITCHES ISSUE CONFIGURATION 613 SWITCHING REQUEST TO ALL Ν OK VIRTUALIZATION SWITCHES AND WAIT FOR RESPONSE FROM 614 ALL VIRTUALIZATION SWITCHES ISSUE I/O RESTART REQUEST TO ALL VIRTUALIZATION 604 OK SWITCHES AND WAIT FOR RESPONSE FROM ALL 605 1 VIRTUALIZATION SWITCHES **ISSUE I/O RESTART REQUEST** 615 617 TO ALL VIRTUALIZATION OK SWITCHES AND WAIT FOR REMOVE, FROM **RESPONSE FROM ALL** CONTROL RANGE. VIRTUALIZATION SWITCHES VIRTUALIZATION 606 SWITCH TO WHICH OK RESPONSE OF **SUCCESS WAS** 607 NOT RETURNED 616 RETURN RESPONSE OF SUCCESS TO MANAGEMENT CONSOLE **RETURN ERROR AND** ITS CAUSE TO MANAGEMENT CONSOLE **END**

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Title: STORAGE SYSTEM
Atty D cket No. 16869N-102200US

Sheet 29 f 29

